Impact of the Conservation Reserve Program on Wildlife Conservation in the Midwest


Savannah sparrow feeding nestlings

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Abstract
Evidence that the Conservation Reserve Program (CRP) created habitat used by grassland birds in the Midwest is unquestionable. Strong evidence that avian abundance in CRP habitats was substantially higher than in rowcrop habitats typically replaced by CRP plantings has accumulated. Additionally, reported nest abundance in CRP habitat was an order of magnitude greater than that in rowcrop sites. Nest success for birds breeding in CRP was reported to be approximately equal to, or higher than, that measured in alternative agricultural or grassland habitats. Limited evidence indicates that reproductive success and survival in CRP habitats in the Midwest were of sufficient quality to yield positive population growth for a few species (including several of high conservation concern). However, data linking the establishment of CRP habitat to positive population growth has been reported for only two grassland bird species in the Midwest. Overall, the evidence accumulated to date indicates that CRP habitat in the Midwest likely contributes to the population stability or growth of many, but not all, grassland bird species.

Introduction
The tallgrass prairie ecosystem dominated the Midwest landscape prior to settlement by people of European ancestry. The approximately 94 million acres of tallgrass prairie originally extant has been reduced by 83 to > 99% in midwestern states (Noss et al. 1995, Steiner and Collins 1996). Additionally, in recent years the loss of agricultural grasslands (largely nonnative grass hayfields and pastures) has been substantial (Herkert et al. 1996).

Because most of the destruction of prairie habitat occurred prior to intensive monitoring of wildlife populations, the full effect of the losses on conservation of wildlife cannot be assessed. However, Herkert et al. (1996) identified 13 species of grassland birds as threatened or endangered in eight midwestern states (Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio,

Wisconsin), and another 11 species were ranked of high conservation concern. Similar, comprehensive analyses of the conservation status of other grassland wildlife taxa in the Midwest have not been attempted, but the decline of several prairie-associated mammals (e.g., bison [*Bison bison*], elk [*Cervis canadensis*], jackrabbits [*Lepus* spp.]), reptiles (e.g., massasauga [*Sistrurus catenatus*], box turtle [*Terrapene* spp.]), amphibians (e.g., spadefoot toads [*Scaphiopus* spp.]), and butterflies (e.g., Dakota skipper [*Hesperia dacotae*], Karner blue) are well known (see reviews by Arenz and Joern 1996, Benedict et al. 1996, Corn and Peterson 1996).

In the eight midwestern states previously identified, there are currently > 3.6 million acres enrolled in the Conservation Reserve Program (CRP). The vast majority of those acres were planted with grasses (> 80%). The increase in grassy habitats associated with the CRP constitutes the largest addition of grassland habitat in the Midwest since European settlement.

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It was widely assumed that the establishment of CRP plantings would positively affect grassland wildlife populations (e.g., Berner 1988). Because of the more extensive background data on population status of birds in North America, those species offer the best opportunity to evaluate the impact of the CRP on wildlife conservation. The purpose of this paper is to review the evidence regarding the impact of the Conservation Reserve Program on grassland bird conservation in the Midwest.

Birds and CRP in the Midwest

Among the intended objectives of the Conservation Reserve Program was an increase in total habitat available for wildlife, especially grassland birds. The implicit assumption underlying this objective was that grassland habitat was limiting populations of many species of birds. By establishing new grass plantings, it was expected that birds would occupy those habitats and successfully reproduce, thereby augmenting their populations. Because populations of many species of grassland birds were known to be declining (Sauer et al. 1996), the impact of the Conservation Reserve Program on wildlife conservation was projected to be substantial. Therefore, any assessment of the impact of the Conservation Reserve Program must consider how well the program provided habitat for various songbirds, whether those species successfully reproduced in CRP habitats, and whether species population declines were slowed or reversed.

To fully assess whether the Conservation Reserve Program met its objective of contributing to wildlife conservation, several levels of evidence of a positive impact on conservation of birds in the Midwest, from weakest to strongest, should be investigated. They are as follows:

■ Evidence of use (occupancy) of CRP habitats;

■ Evidence of high abundance in CRP relative to alternative habitats, especially cropfields that were replaced by CRP;

■ Evidence of nesting in CRP and comparison with alternative habitats;

■ Evidence of high reproductive success relative to alternative habitats;

■ Evidence of reproductive success and survival in CRP habitats sufficient for positive population growth (i.e., $\lambda > 1.0$);

■ Evidence of positive population growth (or reduced decline) after initiation of the CRP.

Evidence of Bird Use of CRP Habitats

There is overwhelming evidence that CRP plantings were used by a variety of bird species.

There is overwhelming evidence that CRP plantings were used by a variety of bird species. In their review of the literature, Ryan et al. (1998) listed 92 species of birds, including 53 songbirds (Order Passeriformes), that had been observed using CRP plantings in the central United States. In the most extensive study of songbird use of CRP in the Midwest, Best et al. (1997) observed over 60 species of birds using CRP habitats during the breeding season. Similarly, Best et al. (1998) recorded over 40 bird species using CRP grasslands as winter feeding or roosting habitat. Interestingly, the total number of bird species observed in CRP plantings by Best et al. (1997, 1998) did not differ markedly from the number of species they observed in nearby rowcrop fields.

Iowa CRP (L. Betts)

Evidence of High Bird Abundance in CRP Habitats

Best et al. (1997) compared avian abundance in paired CRP and rowcrop habitats in six midwestern states (Indiana, Michigan, Iowa, Missouri, Nebraska, and Kansas) in the early 1990s. Best et al. (1997) detected from 1.4 to 10.5 times more birds in CRP grasslands than rowcrop fields during the breeding season. Similarly, King and Savidge (1995) reported avian abundance to be four times greater in CRP habitat than cropfields in Nebraska. Best et al. (1997) further reported 16 species of birds that were unique or substantially more abundant in CRP habitat than in nearby rowcrop fields. Three of the four bird species they most frequently observed in CRP (dickcissel, grasshopper sparrow, and bobolink) have been undergoing significant population declines. Additionally, Henslow's sparrow and sedge wren, species of high conservation concern in the Midwest (Herkert et al. 1996), occurred only in CRP habitat. Of the five species unique or substantially more abundant in rowcrops than in CRP habitats (Best et al. 1997) only one, the lark sparrow, is of moderate conservation concern (Herkert et al. 1996).

Direct comparisons of avian abundance in CRP and alternative grassland habitats have been rare. Klute and Robel (1997) documented higher abundances of dickcissels, grasshopper sparrows, meadowlarks, and upland sandpipers in grazed pastures versus CRP plantings in Kansas.

During the winter months, ring-necked pheasants, northern bobwhites, American tree sparrows, dark-eyed juncoes, and American goldfinches were the most abundant or widely distributed species observed in CRP habitats (Best et al. 1998). All but the goldfinch have been undergoing long-term population declines (Sauer et al. 1996). In a separate study, Burger et al. (1994) provided evidence that CRP plantings in Missouri provided important winter cover for northern bobwhites. They documented that 69% of nighttime roosts occurred in CRP habitat in an area where CRP made up only 15% of the landscape. Rogers (1999) reported higher use of CRP habitat by ring-necked pheasant adults and young than expected based on availability in western Kansas.

Evidence of Nesting in CRP Habitats

CRP plantings have been extensively used for nesting by grassland birds in the Midwest. Best et al. (1997) located 1,638 nests of 33 bird species in CRP habitat versus only 114 nests of 10 species in a similar area of rowcrops. Nests of red-winged blackbird, dickcissel, and grasshopper sparrow were the most frequently located in CRP habitat by Best et al. (1997). In rowcrop, they most frequently discovered red-winged blackbird, vesper sparrow, and horned lark nests. In northwest Texas, Berthelsen et al. (1990) found approximately six pheasant nests per 10 acres of CRP land, but no nests in cornfields. In Missouri, 55% of northern bobwhite nests and 46% of brood foraging locations occurred in CRP habitat that comprised only 15% of the largely agricultural landscape.

Evidence of High Reproductive Success Relative to Alternative Habitats

Nest success of birds breeding in CRP habitat has been equal to or greater than that reported for alternative agricultural habitats.

Nest success of birds breeding in CRP habitat has been equal to or greater than that reported for alternative agricultural habitats. Apparent nest success for 1,526 nests monitored in CRP habitats by Best et al. (1997) was 40% versus 36% for 113 nests monitored in rowcrop fields. Using a subset of the data from Best et al. (1997), Patterson and Best (1996) reported apparent nest success of 38% in CRP habitat and 32% in rowcrop fields in Iowa. McCoy (1996), using the Missouri subset of the Best et al. (1997) data, reported significantly higher Mayfield nest success in CRP habitats versus rowcrop fields in two of three years (1993: CRP = 45%, rowcrop = 12%; 1995: CRP = 46%, rowcrop = 9%; 1994: CRP = 43%, rowcrop = 53%).

McCoy et al. (1999) further noted that reproductive success of grasshopper sparrows, field sparrows, dickcissels, American goldfinches, and common yellowthroats breeding in CRP habitat in Missouri was similar to or higher than that reported from alternative grassland habitats in a variety of prior studies. Klute and Robel (1997) compared Mayfield nest success of seven species breeding in CRP and pasture habitats in Kansas. They detected no differences; however, sample sizes of nests were very small. Granfors et al. (1996) reported Mayfield nest survival for eastern meadowlarks in CRP and grazed grassland habitats in Kansas. Nest success in CRP and grazed grass did not differ (1990: CRP = 17%, grazed = 25%; 1991: CRP = 10%, grazed = 20%), but they noted the low power of their statistical tests. Gransfors et al. (1996) also reported no difference in the mean number of nestlings fledged, for radio-marked females occupying CRP and grazed habitats (CRP = 1.9 fledged/female, grazed = 0.7).

Dickcissel (D. Seaman)

CRP habitats were of sufficient quality for four [of eight grassland bird] species . . . to produce young in excess of that needed to maintain stable populations.

Evidence of Reproductive Success or Survival Adequate for Positive Population Growth

McCoy et al. (1999) quantified seasonal fecundity for eight grassland bird species breeding in CRP habitats in Missouri and assessed whether it was adequate to offset annual mortality (i.e., achieve λ's > 1.0). They concluded that CRP habitats were of sufficient quality for four species (grasshopper sparrow, field sparrow, eastern meadowlark, and American goldfinch) to produce young in excess of that needed to maintain stable populations. Common yellowthroat reproductive success in CRP habitats varied substantially among years, with output being in excess of that needed for maintenance of a stable population in only one of three years (McCoy et al. 1999). For two species (dickcissel and red-winged blackbird), production of young from nests in CRP habitat was substantially less than necessary to maintain stable populations (McCoy et al. 1999).

Patterson and Best (1996) reported apparent nest success of ring-necked pheasants breeding in Iowa CRP habitats as 34%, considerably higher than that reported for alternative agricultural habitats studied previously in Iowa (see Ryan et al. 1998 for review). The 34% rate reported by Patterson and Best (1996) exceeded the level of nest success predicted by Hill and Robertson (1988) as necessary to maintain stable populations.

No direct measures of survival of grassland birds occupying CRP habitats for all or significant portions of the annual cycle are available. However, Burger et al. (1995) did not detect a difference in annual survival of northern bobwhites occupying a landscape comprised of 15% CRP habitat (5.4%) versus an agricultural area without CRP (5.1%).

Evidence of Population Growth Related to CRP Habitat

Based on Breeding Bird Survey data from Illinois, Herkert (1997) demonstrated a significant positive relationship between the population trend for Henslow's sparrow and the percent of CRP habitat in a county. Five of eight counties with ≥ 3% of the area in CRP habitat had positive population trends for Henslow's sparrow, whereas eight of 11 counties with < 3% CRP had negative trends. Unfortunately, the effect of CRP habitat establishment was not sufficient to reverse the long-term declining trend in Henslow's sparrows in Illinois (Herkert 1997).

In similar analyses, Herkert (1998) reported a significant change in the slope of the population trend for grasshopper sparrows after the initiation of the CRP. In the eight years prior to the CRP, 179 (64%) of 278 Breeding Bird Survey routes had negative trends. In the eight years after, only 149 (54%) of the routes had negative trends. The overall trend prior to CRP initiation was strongly negative, but was essentially level during the CRP years. Herkert (1998) also showed a greater increase in trend slopes in areas with higher CRP acreages (> 3.8% of the landscape).

. . . a greater increase in [population] trend slopes in areas with higher CRP acreages . . .

In Minnesota, ring-necked pheasant populations tripled from the mid-1980s to the early 1990s as CRP habitat increased (WMI 1994, Ryan et al. 1998). Also in Minnesota, Kimmel et al. (1992) reported strong, positive relationships between population indices for pheasants and for meadowlarks, but not for gray partridges and percent of CRP grassland in the landscape. Pheasant populations in Nebraska increased from < 2 birds/100 miles of survey route during 1983-1985 to > 10 birds/100 miles in 1994 as CRP was established. King and Savidge (1995) reported significantly more pheasant observations in study areas with 18-21% CRP landscape coverage versus areas with 2-3% CRP. In Iowa, Riley (1995) compared pheasant populations in the five years immediately prior to CRP initiation with those in the first five years after establishment. He recorded a significant increase in mean detections from 37 to 48/survey route. Most the change occurred where CRP was established in landscapes initially comprised of > 70% cropland. In contrast to these studies, Rogers (1999) reported no pheasant population response to CRP establishment in western Kansas. Similarly, Roseberry and David (1994) detected no relationship between northern bobwhite population indices and amounts of CRP in the landscape in Illinois.

Remaining Questions

To better evaluate the impact of the CRP on wildlife conservation and to improve the efficiency (i.e., increased conservation benefits per dollar expended), several lines of additional research are needed including:

■ Direct comparisons of abundance and reproductive success of species breeding in native prairie and CRP grasslands;

■ Further evidence of population level change attributable to the availability of CRP grassland habitat at regional levels;

■ The effects of distribution of CRP plantings in different landscape contexts on avian use and reproductive success in CRP fields (e.g., should CRP contracts be clumped or dispersed in landscapes with high or low amounts of existing grassland?);

■ Comprehensive analyses of the impacts of types, frequency, and extent of disturbances (e.g., mowing, burning, grazing) of CRP vegetation on avian abundance and reproductive success;

■ Greater focus on nonavian wildlife response to Conservation Reserve habitats.

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